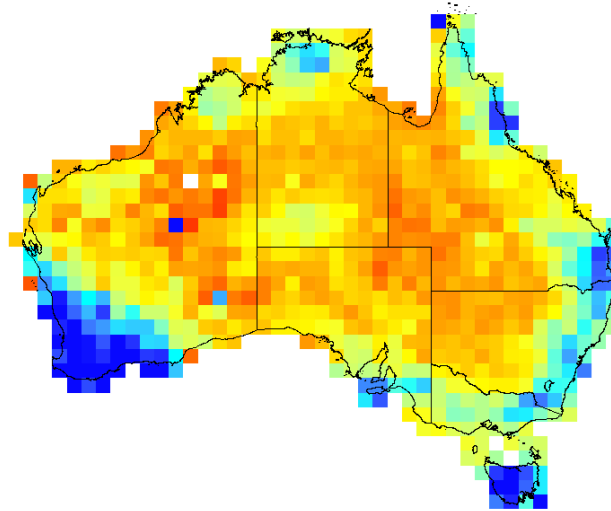


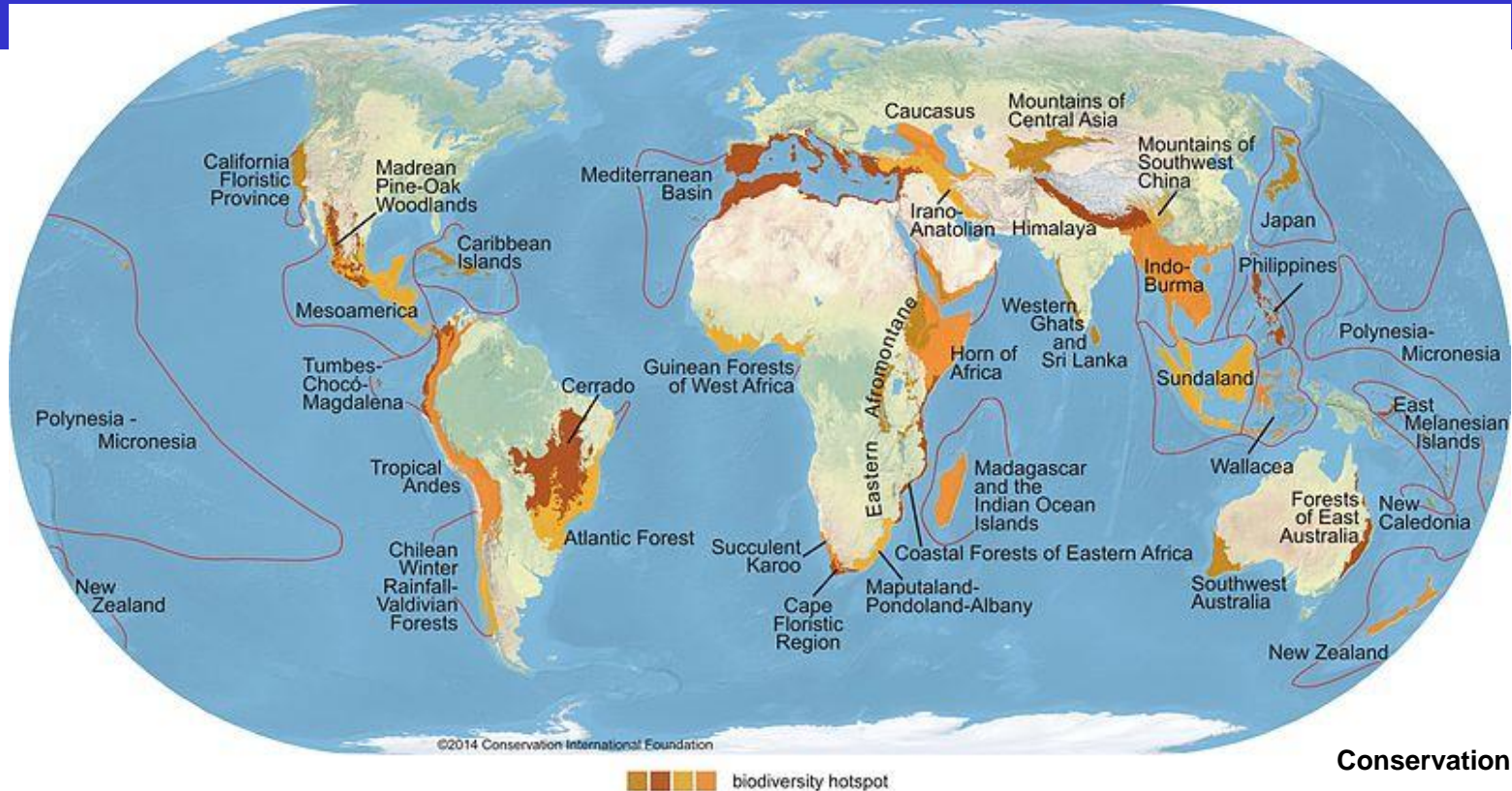
Patterns of endemism in the Australian flora (and using Biodiverse to find them)



Shawn Laffan



Biodiversity assessment is commonly based on species



Conservation International
Myers et al. 2000, *Nature*
Carnaval et al. 2009, *Science*

36 world biodiversity hotspots

>1500 endemic plant species
70% of original land cleared

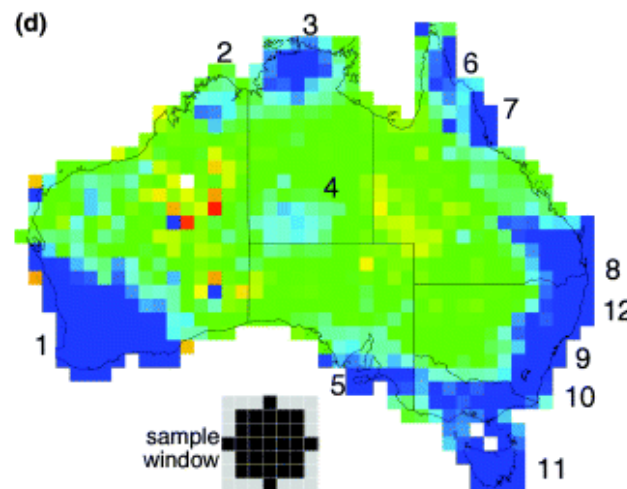
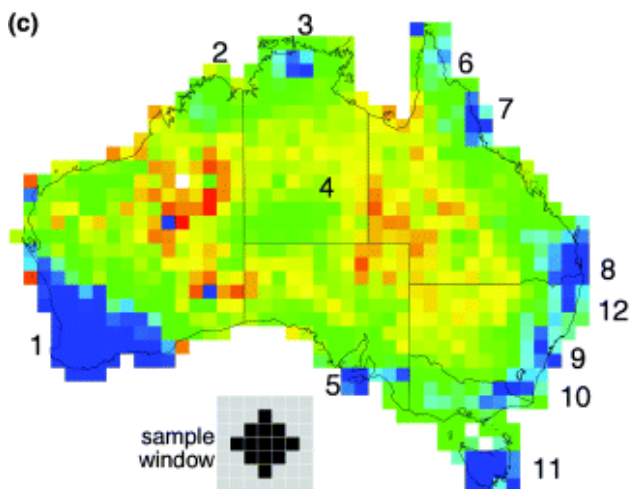
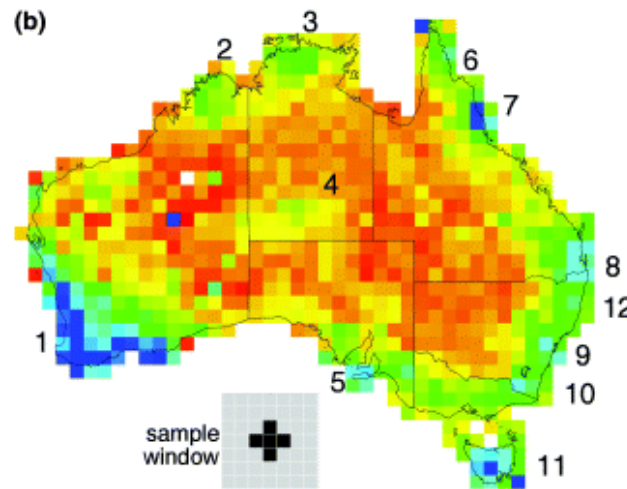
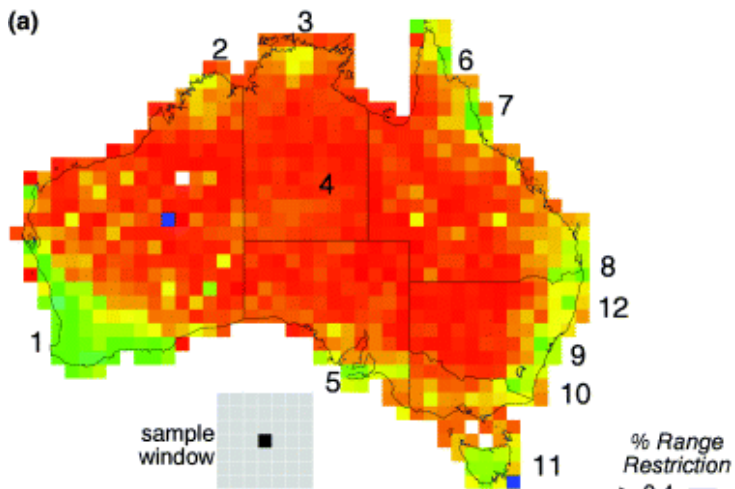
Species (taxon) endemism

(range restricted taxa are more important)

$$WE = \sum_{t \in T} \frac{r_t}{R_t}$$

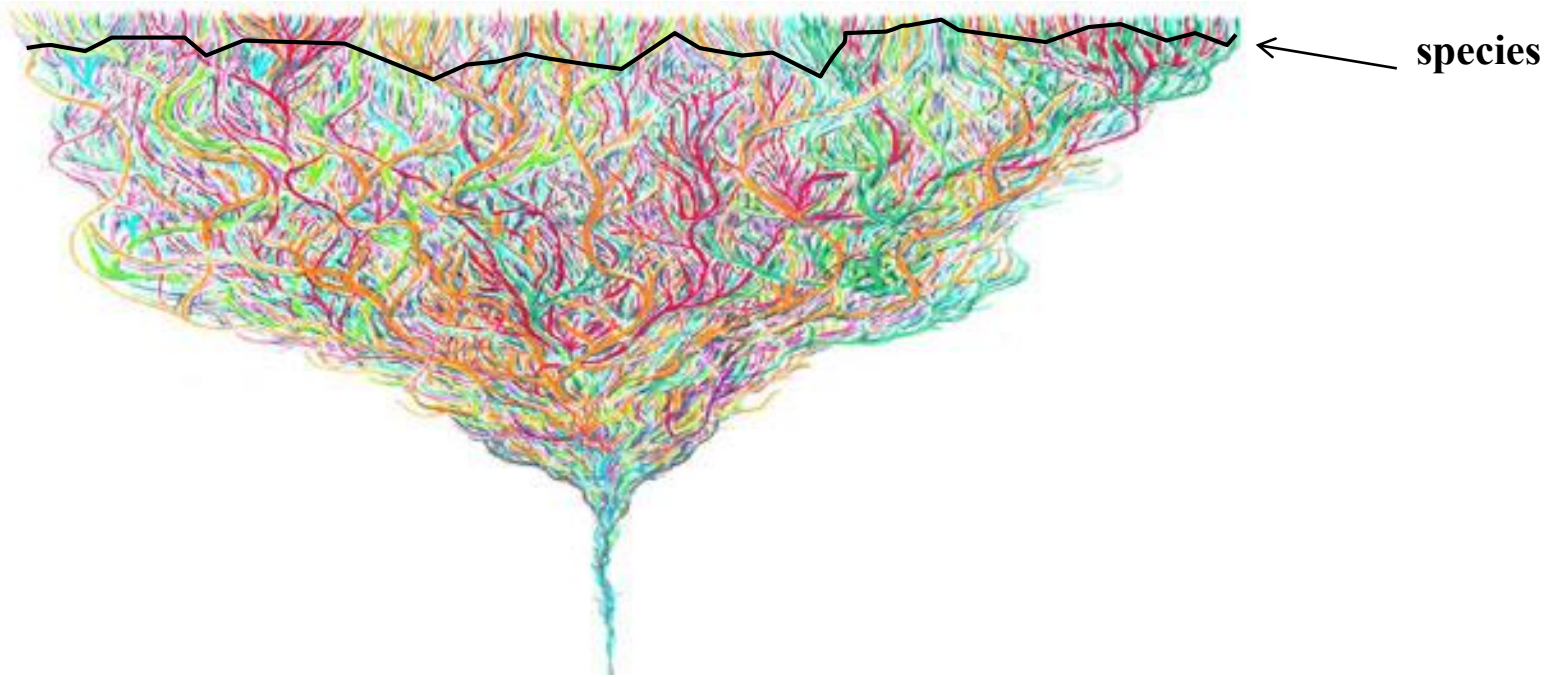
$$CWE = \frac{WE}{Richness}$$

CWE =
Corrected
Weighted
Endemism



But biodiversity is not just species

- And even then a species' level in the tree of life can be arbitrary



Phylogenetic Diversity

Sum the branch lengths in the sample

Biodiverse 1.0_001 C:\shawn\svn\biodiverse_git\data\example_data_x64.bps

File Basedata Matrices Trees Analyses Help

Basedata Example_site_data Matrix (none) Tree 'Example_tree'

Outputs Labels - Example_site_data

Label	Variety	Samples	Redundancy	Selected
Genus:sp1	23	64	0.640625	1
Genus:sp10	28	153	0.816993	0
Genus:sp11	49	328	0.850610	0
Genus:sp12	29	151	0.807947	1
Genus:sp13	3	27	0.888889	0

No selected matrix

$$PD = \sum_{c \in C} L_c$$

5.0000
3.3333
1.6667
0

Group: 3850000:1750000

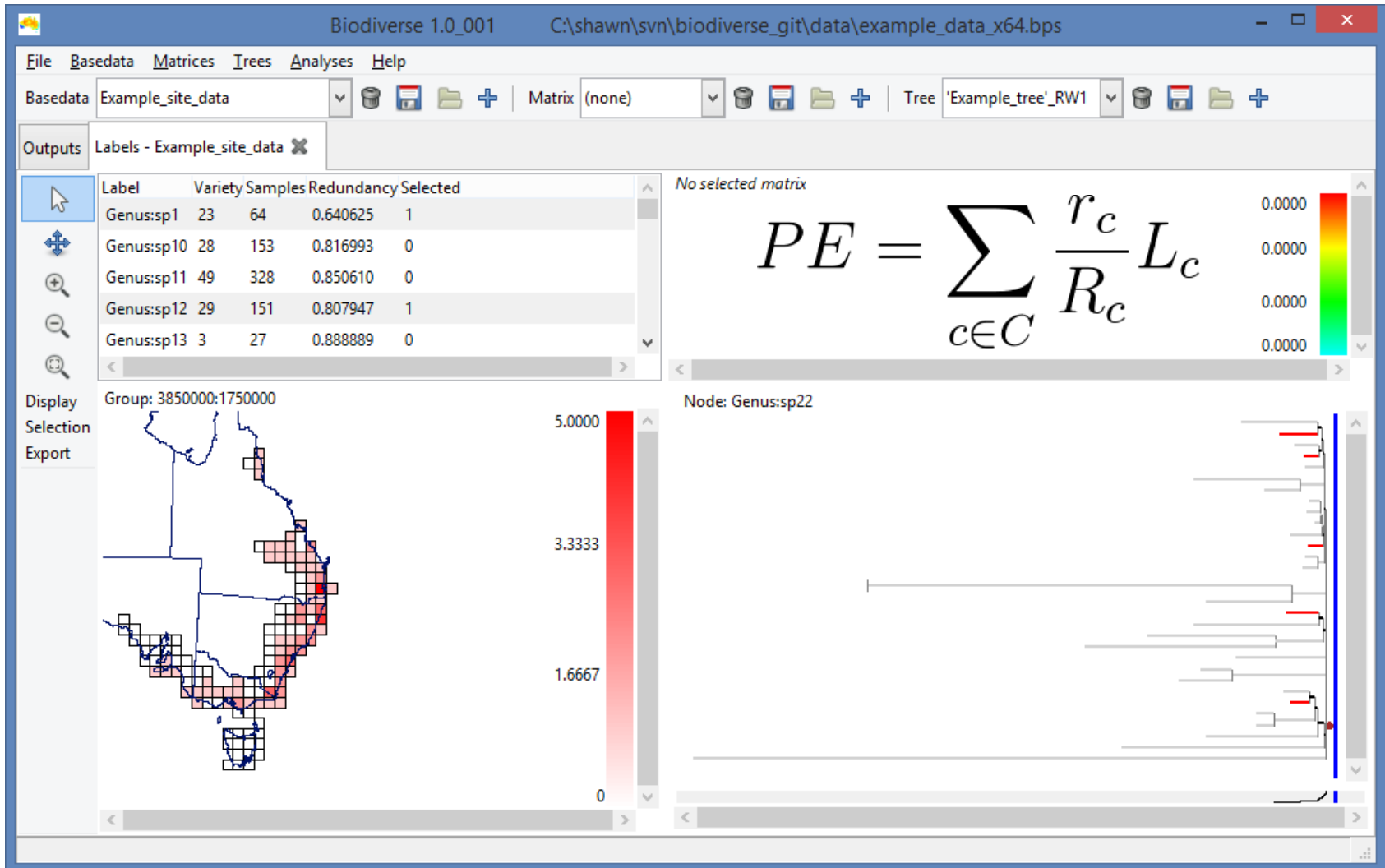
Node: Genus:sp22

The screenshot displays the Biodiverse software interface. At the top, the window title is 'Biodiverse 1.0_001' and the file path is 'C:\shawn\svn\biodiverse_git\data\example_data_x64.bps'. The menu bar includes 'File', 'Basedata', 'Matrices', 'Trees', 'Analyses', and 'Help'. Below the menu, there are dropdown menus for 'Basedata' (Example_site_data), 'Matrix' (none), and 'Tree' (Example_tree). The 'Outputs' section shows 'Labels - Example_site_data' with a table of taxonomic data. To the left of the table is a vertical toolbar with icons for selection, zoom, and display. Below the table is a map of a region with a grid overlay, and a vertical color scale ranging from 0 to 5.0000. To the right of the map is a phylogenetic tree with several branches highlighted in red. The tree is labeled 'Node: Genus:sp22'. The equation $PD = \sum_{c \in C} L_c$ is displayed in the center of the interface, with a color scale to its right ranging from 0.0000 to 0.0000.

Phylogenetic endemism

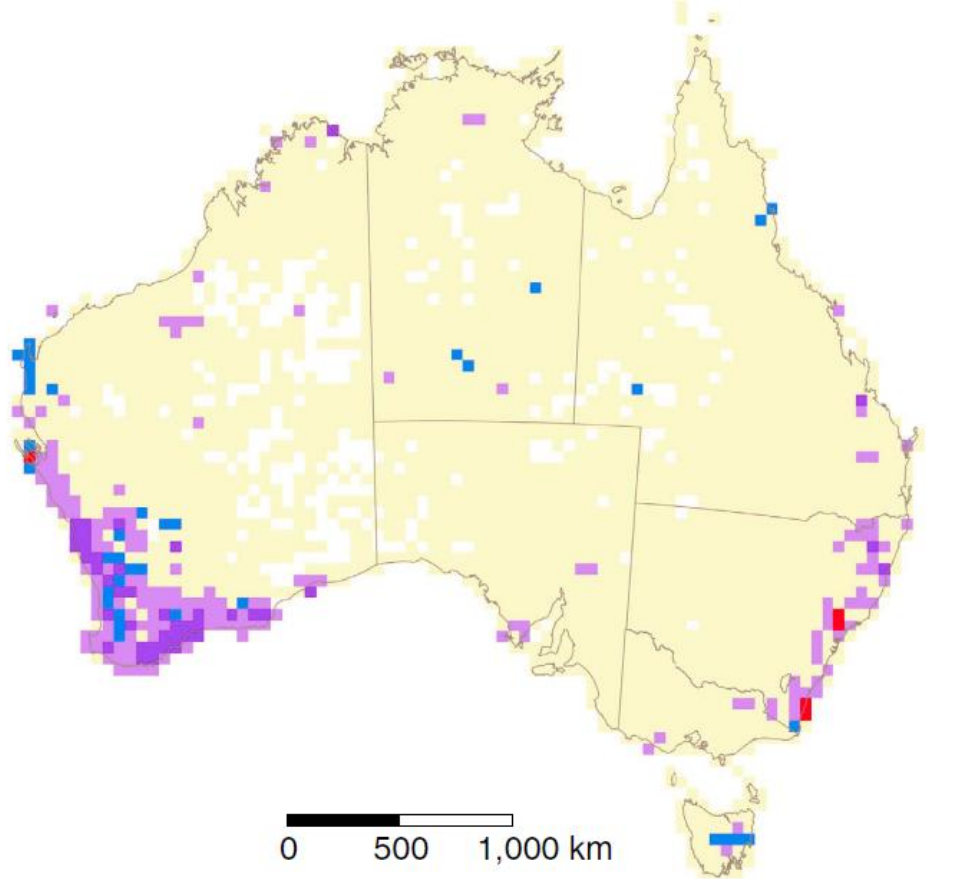
Range weighted PD

Internal branch ranges are the unions of their tip ranges

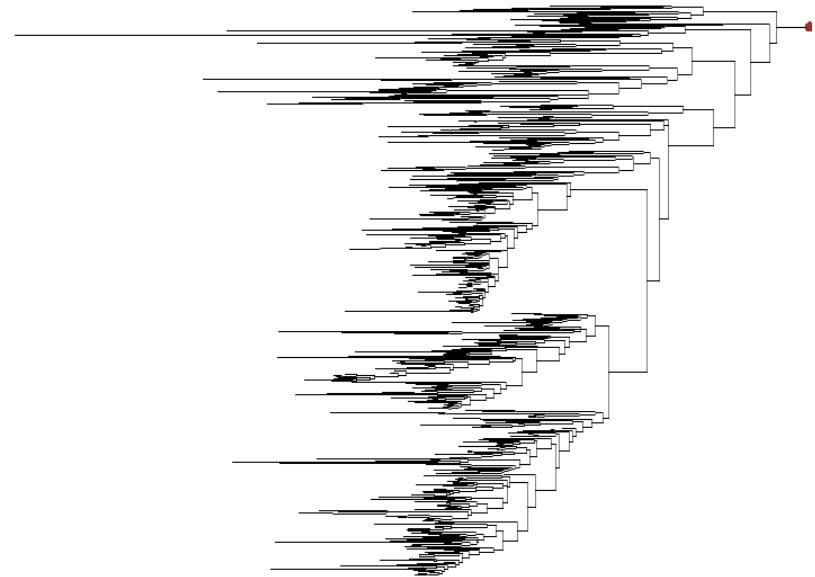
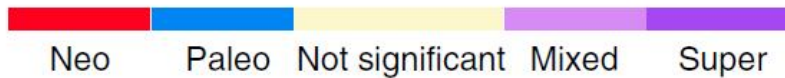


CANAPE

Categorical Analysis of Neo And Palaeo Endemism



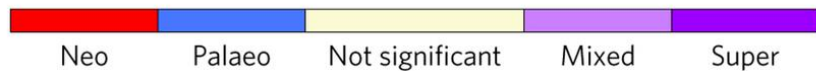
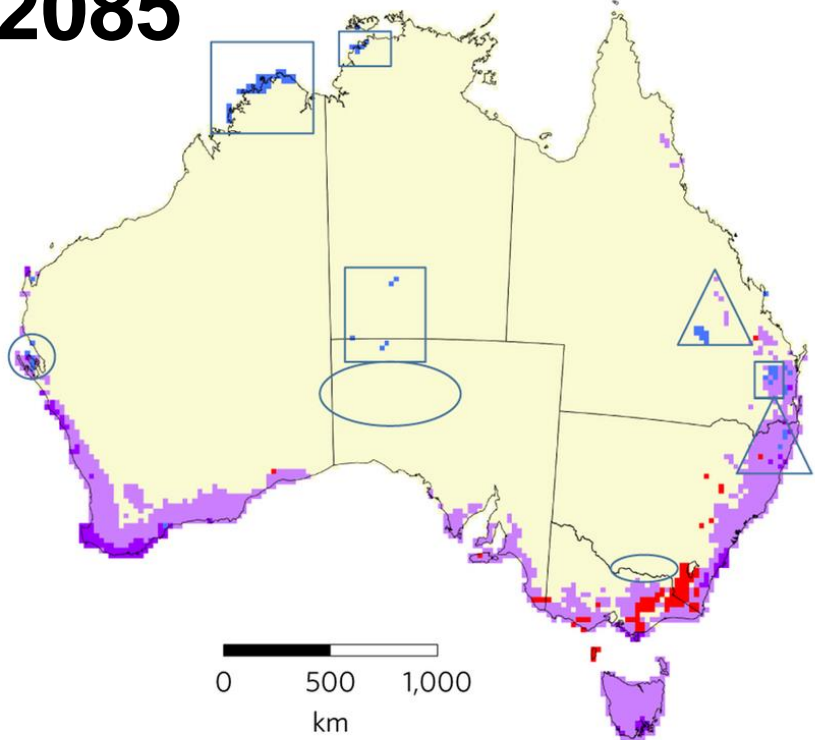
0 500 1,000 km



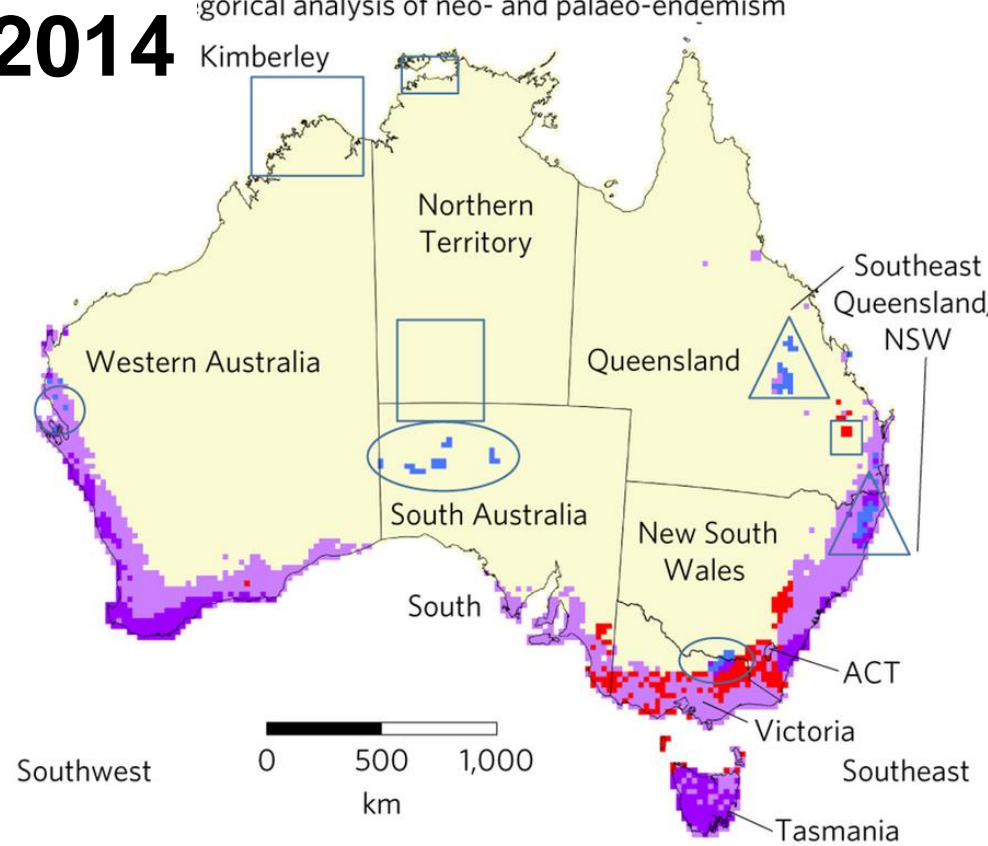
Mishler, Knerr, González-Orozco, Thornhill, Laffan & Miller (2014)
Nature Communications

Eucalypts under climate change

b 2085



2014

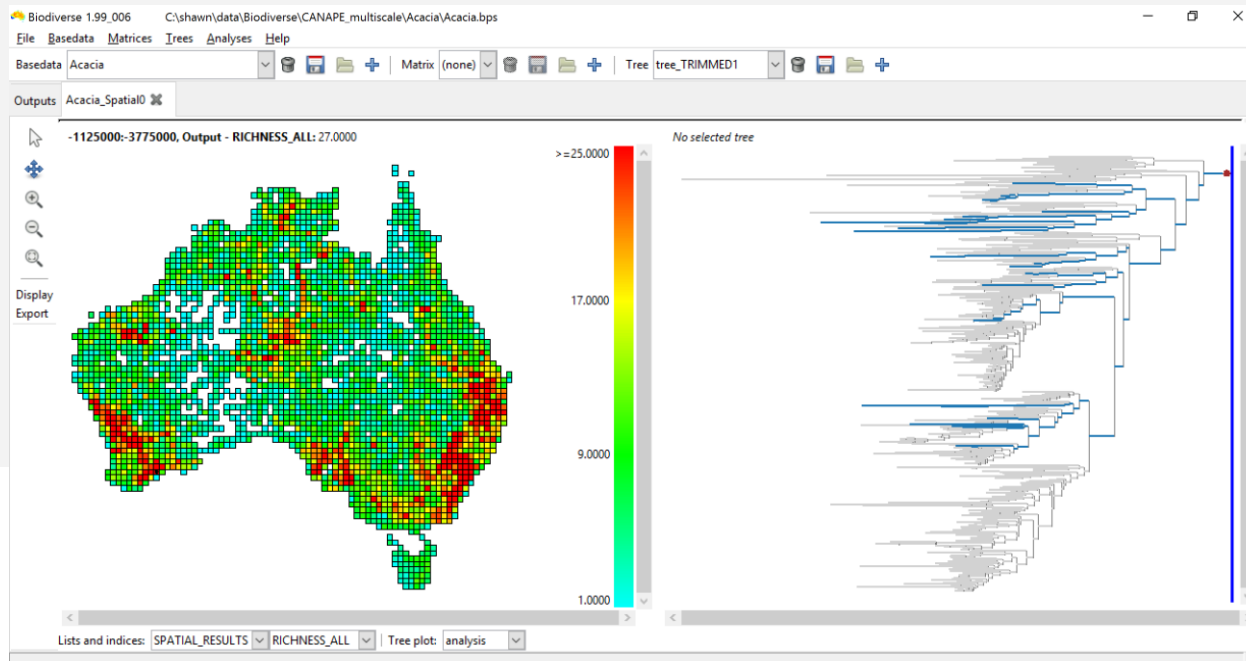


Gonzalez-Orozco et al. (2016)
Nature Climate Change

Acacia - the Wattles



- 1029 species, 1020 in Aus
- Phylogenetic tree with 506 *Acacia* spp
- 218,000 records downloaded from AVH
- Aggregated to 50 km cells



Biodiverse

<http://purl.org/biodiverse>

- Visualisations
 - Linked views: map, taxon list, tree & matrix
- Moving window analyses
 - Arbitrarily complex neighbourhoods
- Agglomerative cluster analyses and region grouping
 - Spatially constrained
- Randomisations
 - Completely random, spatially structured, ...
- 330+ indices
 - Taxon, phylogenetic, functional & environmental spaces
- **FREE AND OPEN SOURCE**

See also

- <http://biodiverse-analysis-software.blogspot.com.au/>
- <https://purl.org/biodiverse/wiki/PublicationsList>